CLUTCH DEVICE FOR MAGNETIC RECORDING/REPRODUCING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a magnetic recording/reproducing apparatus, and in particular to a clutch device for a magnetic recording/reproducing apparatus which is capable of transmitting a power for traveling a tape regularly regardless of a quantity of the tape wound around a reel.

2. Description of the Prior Art

Figure 1 illustrates a tape travelling structure of a general magnetic recording/reproducing apparatus.

As shown in Figure 1, a supplying reel driving body 1 and a winding reel driving body 21 are installed to drive a supplying reel (not shown) and a winding reel (not shown) of a tape cassette (not shown) at one side of a main chassis (C).

A plurality of posts and guide rollers are installed on the main chassis (C) to guide travelling of a tape (T) released from a tape cassette.

A tension post 3 for controlling a tensile force of a travelling tape (T) is installed at a tension arm 4.

The tension arm 4 is rotated at a predetermined angle according to the tension of the tape (T) on the main chassis (C) centering around a shaft pin 2, for which the tension arm 4 is elastically supported by a spring 5.

The tape (T) having passed the tension post 3 is guided by a guide post 6 and transmitted to a full width erasing head 7.

The full width erasing head 7 removes in advance a signal which has been recorded on the tape in a recording mode.

An inertia roller is installed at a position past the full width erasing head 7 to guide the travelling of the tape (T).

Next, the tape (T) is guided by guide posts 10 and 11 of the supplying and winding side which are moved along loading paths formed at both sides of a rotational head drum 9.

The guide posts 10 and 11 draws the tape (T) from the inside of the tape cassette, the position indicated in a dotted line as shown in Figure 1, so as to be wound and traveled.

A supplying slant post 12 and a winding slant post 13 are provided next to the guide posts 10 and 11 toward the rotational head drum 9, so as to guide the traveling of the tape (T).

The guide posts 10 and 11 and the slant posts 12 and 13 are installed on a supplying and winding slant bases 14 and 15 and moved along the loading path.

As shown in Figure 1, the rotational head drum 9, on which the tape (T) is wound and traveled, is provided with a rotational head (not shown) for reading a signal recorded on the tape (T) or recording a signal.

The tape (T) passes the rotational head drum 9 and the slant post 13 and the guide post 11 of the winding side and then passes the audio control head 16. The audio control head 16 performs deleting, recording and reproducing of an audio signal, and recording and reproducing a control signal.

A guide post 17 is provided on the main chassis (C) at an adjacent location of the audio control head 16 to control the traveling height of the tape (T).

A capstan shaft 18 for providing a traveling force to the tape (T) is installed

at a position passing the guide post 17. The capstan shaft 18 is an output shaft of a capstan motor (not shown) installed at the opposite face of the main chassis (C), and a traveling direction of the tape (T) is determined depending on the rotational direction of the capstan motor.

A pinch roller 19 is installed selectively tightly-attached to the capstan shaft 18 to provide a force for pulling the tape (T).

A winding post 20 is provided at an adjacent location of the pinch roller 19 and the capstan shaft 18. A winding arm (not shown) is installed and moved at the winding post 20.

Between the supplying reel driving body 1 and the winding reel driving body 21, a clutch assembly 22 is installed to drive the supplying reel or the winding reel at a certain torque regardless of the amount of the tape (T) wound on the supplying reel or the winding reel upon receipt of a driving force from the capstan motor.

An idler gear 24 is installed at a front end of an idler arm 25 which is coaxially installed with the clutch assembly 22. The idler gear 24 is selectively connected to either the supplying reel driving body 1 or the winding reel driving body 21 for transferring a driving force thereto upon receipt of a driving force from the clutch assembly 22.

A tension brake 27 is installed wound on the supplying reel driving body 1 with its both ends fixed at the tension arm 4. The tension brake 27 controls the rotational speed of the supplying reel driving body 1 according to the operation of the tension arm 4, thereby controlling a tension of the tape (T).

The construction of the clutch assembly 22 will be described in detail with reference to accompanying Figures 2 and 3.

As depicted in Figures 2 and 3, a centrical shaft 30 is installed on the main chassis C. A driving pulley 32 is installed so as to rotate centering around the centrical shaft 30. A belt 31 recieivng a power from the capstan motor is wound around the driving pulley 32 and it receives a rotatinal force of the capstan motor. A cyllindrcal clutch holder 34 is installed to the driving pulley 32.

And, an up/down gear 36 is installed to the centrical shaft 30 on the same axis as the driving pulley 32. The up/down gear 36 transmits a power of the capstan motor by selectively engaging with the idler gear 24. Clutch springs 18, 18' are installed to the up/down gear 36. The clutch springs 18, 18' are wound around the outer circumferential surface of the cylindrical clutch holder 34. Herein, the lower spring 18 and the upper spring 18' are wound around in the opposite direction.

Accordingly, accorindg to the rotational direction of the driving pulley 32, for example, when the lower spring 18 is locked and the upper spring 18' rubs against the surface of the clutch holder 34, a slip occurs, accordignly traveling of the tape (T) can be performed with a regular torque regardless of a quantity of the tape (T) wound around the reel.

In the meantime, a first gear portion 37 and a second gear portion 37' are formed at the up/down gear 36, the first and the second gear portions 37, 37' reduce and transmit the power by respectively and selectively engaging with gear portions of the idler gear 24.

The idler gear 24 is installed on the front end portion of the idler arm 25 installed rotatable centering around the centrical shaft 30, each gear portion (not shown) selectively engaging with the first and the second gear portions 37, 37' of the up/down gear 36 is formed at the idler gear 24. The idler gear 24 trasnmits the

power of the capstan motor to the supplying reel and the winding reel by selectively engaging with the supplying reel body 1 and the winding reel body 21.

However, the above-mentioned conventional magnetic recording/reproducing apparatus has below problems.

The clutch springs 18, 18' are used for traveling of the tape (T) with a regular tension regardless of a quantity of the tape (T) wound aounrd the supplying reel and the winding reel, herein the clutch springs 18, 18' are selectively used in accordance with a traveling direction of the tape (T).

In use of the clutch springs 18, 18', a production cost is increased due to lots of construction parts. In addition, an operation efficiency of an assembly process is lowered.

SUMMARY OF THE INVENTION

In order to solve above-mentioned problems, it is an object of the present invention to provide a clutch device for a magnetic recording/reproducing apparatus which is capable of reducing a production cost and improving an efficiency of an assembly operation by minimizing the number of components.

In order to achieve the above-mentioned object, a clutch device for a magnetic recording/reproducing apparatus comprises a rotating centrical shaft installed on a main chassis; a driving pulley installed to the rotating cetnrical shaft, rotating by receiving a power of a driving source and having a cylindrical pulley holder portion; an up/down gear having a cylindrical gear holder unit having an outer diameter smaller than an inner diameter of the pulley holder portion and ascendable/descendable along the rotating centrical shaft; and a clutch spring

placed between the inner surface of the pulley holder portion and the outer surface of the gear holder unit and selectively transmitting a power with a certain torque from the driving pulley to the up/down gear in accordance with the rotational direction of the driving pulley.

The clutch spring has a coil spring structure, the end of the clutch spring is contacted to the inner surface of the pulley holder portion, and the other end of the clutch spring is contacted to the outer surface of the gear holder unit.

A certain portions of the pulley holder portion and the gear holder unit are formed so as to project out toward the clutch spring in order to contact with the clutch spring.

The gear holder unit includes an outer cylindrical portion having an inner diameter larger than an inner diameter of the pulley holder portion and connected to the pulley holder portion.

The driving pulley and the up/down gear respectively include an engaging means in order to rotate together by being meshed with each other when the up/down gear is transferred toward the driving pulley.

The driving pulley and the up/down gear respectively include a movement restriction means restricting the up/down gear not to moving over a specific range when the up/down gear moves in a direction separated from the driving pulley.

The up/down gear is constructed with a gear unit having a large gear and a small gear and the gear holder unit, and the gear unit and the gear holder unit are combined with each other.

A boss portion is formed at the center of the gear unit, the large gear is formed at a disc-shaped portion extended from the boss portion, and the small gear having a diameter smaller than a diameter of the large gear is formed at the

side of the disc-shaped portion.

A cylindrical holder supporting portion is formed at the other side of the gear unit so as to support the gear holder unit.

The gear holder unit is constructed with an inner cylinder portion and an outer cylinder portion, the clutch spring is contacted to the inner cylinder portion, and an engaging rib is formed at the outer cylindrical portion.

The inner cylindrical portion has a hook structure so as to engage with the driving pulley.

A driving pulley of a clutch device for a magnetic recording/reproducing apparatus comprises a pulley body formed as a disc shape and a belt is wound around the outer circumference; a boss portion combined with a rotating centrical shaft; a bridging portion projected so as to restrict a movement of an up/down gear; a pulley holder portion at which a clutch spring is contacted to its inner surface; and an engaging rib combined with an up/down gear so as to rotate together; wherein the boss portion, the bridging portion, the pulley holder portion and the engaging rib are formed as a cylindrical shape and orderly placed from the center of the pulley body.

A clutch spring of a clutch device for a magnetic recording/reproducing apparatus comprises an inner contacting portion formed at a certain portion, contacted to an up/down gear and having respectively lots of the number of windings; an outer contacting portion placed at the other portion, contacted to a driving pulley and having respectively lots of the number of windings; and a connecting portion connecting the inner contacting portion and the outer contacting portion and having the number of windings less than those of the inner contacting portion and the outer contacting portion.

A diameter of the inner contacting portion is formed so as to be smaller than a diameter of the outer contacting portion.

Accordingly, a clutch device for a magnetic recording/reproducing apparatus in accordance with the present invention is capable of reducing a production cost and improving an efficiency of an assembly operation by minimizing the number of components.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view showing a tape traveling structure of a general magnetic recording/reproducing apparatus;

Figure 2 is a sectional view illustrating a structure of a clutch device for the magnetic recording/reproducing apparatus taken along the line A-A of Figure 1;

Figure 3 illustrates in detail a combination structure of a clutch holder and a spring of Figure 2;

Figure 4 is a sectional view illustrating a clutch device for a magnetic recording/reproducing apparatus in accordance with the present invention;

Figure 5 is a sectional view illustrating a combination structure of a driving pulley, an up/down gear and a clutch spring;

Figure 6 is a sectional view illustrating a structure of a clutch spring of the clutch device in accordance with the present invention; and

Figures 7A, 7B, 8a and 8B are state diagrams illustrating operation of the clutch device in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereinafter, preferred embodiments of a clutch device for a magnetic recording/reproducing apparatus in accordance with the present invention will be described with reference to accompanying drawings.

There may be a plurality of embodiments of a magnetic recording/reproducing apparatus in accordance with the present invention, hereinafter the preferred embodiment will be described.

As depicted in Figure 4, a clutch assembly 60 is installed on a main chassis 50. In traveling of a tape T by transmitting a power provided from a capstan motor to a supplying reel and a winding reel, the clutch assembly 60 performs the traveling of the tape T with a regular tension regardless of a quantity of the tape T wound around the supplying reel and the winding reel.

In the structure of the clutch assembly 60, a centrical shaft 62 is formed on the main chassis 50. A driving pulley 64 is installed to the centrical shaft 62 so as to be rotatable. The driving pulley 64 receives a power transmitted from the capstan motor through a belt 65, and a cylindrical pulley holder 66 is formed inside the driving pulley 64 on the same axis as the centrical shaft 62. And, an engaging rib 68 is formed on the driving pulley 64 corresponded to the exterior of the pulley holder 66.

An up/down gear 70 is installed to the centrical shaft 62 so as to move in an axial direction along the centrical shaft 62. A sliding hole 72 in which the centrical shaft 62 penetrates is formed at the center of the up/down gear 70. A large gear 74 and a small gear 75 are formed at the up/down gear 70 in order to transmit the power received from the driving pulley 64 to an idler gear 102. The large gear 74 engages with the small gear 106 of the idler gear 102 in a fast

traveling mode, and the smaller gear 75 engages with the large gear 104 of the idler gear 102 in a normal traveling mode in order to transmit the power.

A gear holder 76 is formed at the up/down gear 70 so as to face with the pulley holder 66 of the driving pulley 64. The gear holder 76 has a cylindrical shape in which an inner cylindrical portion 76b and an outer cylindrical portion 76a having the same axis as the centrical shaft 62 are connected each other. The inner cylindrical portion 76b of the gear holder 76 is inserted into the pulley holder 66 so as to be ascendable. Accordingly, the outer diameter of the inner cylindrical portion 76b of the gear holder 76 is formed so as to be smaller than the inner diameter of the pulley holder 66.

And, an engaging rib 78 is formed at the outer cylindrical portion 76a of the gear holder 76 in order to rotate the up/down gear 70 and the driving pulley 64 as one body in the fast traveling mode by engaging with them when the up/down gear 70 moves toward the driving pulley 64.

The driving pulley 64 includes a movement restriction means in order to restrict the up/down gear 70 not to moving over a specific range when the up/down gear 70 moves in a direction separated from the driving pulley 64.

In more detail, a cylindrical bridging portion 64b is formed so as to project into the gear holder unit 76, and the movement restriction means is formed so as to engage the bridging portion 64b with the inner cylindrical portion 76b of the gear holder 76 as a hook structure.

A clutch spring 80 is installed between the driving pulley 64 and the up/down gear 70. The clutch spring 80 is constructed as a coil spring structure. As depicted in Figure 6, in the clutch spring 80, an outer contacting portion 82 is formed at the lower portion so as to contact to the inner surface of the pulley

holder 66 of the driving pulley 64, and an inner contacting portion 84 is formed at the upper portion so as to contact to the outer surface of the gear holder 76. And, the outer contacting portion 82 and the inner contacting portion 84 are connected each other through a connecting portion 86.

In the connecting portion 86 connecting the outer contacting portion 82 and the inner contacting portion 84 in order to form the clutch spring 80 as one body, the number of windings is less than those of the outer contacting portion 82 or the inner contacting portion 84.

The clutch spring 80 is wound when it is rotated in a certain direction and is unwound when it is rotated in the other direction, the outer contacting portion 82 and the inner contacting portion 84 are respectively contacted to the inner surface of the pulley holder 66 and the outer surface of the gear holder 76.

Accordingly, when the driving pulley 64 rotates in a certain direction, the outer contacting portion 82 and the pulley holder 66 are closely contacted each other, the contact of the inner contacting portion 84 and the gear holder 76 is loosened, accordingly a specific torque can be transmitted by a slip. When the driving pulley 64 rotates in the other direction, the inner contacting portion 84 and the gear holder 76 are closely contacted, the contact of the outer contacting portion 82 and the pulley holder 66 is loosened, accordingly a specific torque can be transmitted by a slip.

Herein, in the pulley holder 66 and the gear holder 76, the inner portion 66a and the outer portion 76c are formed so as to project toward the clutch spring 80 in order to contact to the clutch spring 80 smoothly.

In the meantime, the driving pulley 64, the up/down gear 70 and the clutch spring 80 are described in more detail with reference to accompanying Figures 5

and 6.

First, the driving pulley 64 includes a pulley body 64a having a disc shape in which a belt 54 is wound on the outer circumference, a boss portion 64c combined with the rotation centrical shaft 62, the bridging portion 64b projecting in order to restrict the movement of the up/down gear 70 by combining with the inner cylindrical portion 76b of the up/down gear 70 as a hook structure, the pulley holder 66 its inner surface is contacted to the clutch spring 80, and the engaging rib 68 combined with the up/down gear 70 so as to rotate together.

The boss portion 64c, the bridging portion 64b, the pulley holder 66 and the engaging rib 68 have a cylindrical shape and orderly placed from the center of the pulley body 64a.

Next, the up/down gear 70 includes a gear unit 71 having a large gear 74 and a small gear 75 and the gear holder 76, and the gear unit 71 and the gear holder 76 are combined each other.

In the gear unit 71, a boss portion 73 having a sliding hole 72 is formed at the centrical portion, the large gear 74 is formed at the disc-shaped portion extended from the boss portion 73, and the small gear 75 having a diameter smaller than a diameter of the large gear 74 is projected from the side of the disc-shaped portion.

In addition, a cylindrical holder supporting portion 77 is formed at the gear unit 71 so as to be opposite to the small gear 75 in order to support the gear holder 76.

Next, in the clutch spring 80, as depicted in Figure 6, a diameter D1 of the inner contacting portion 84 is smaller than a diameter D2 of the outer contacting portion 82.

In the meantime, a converting lever 90 is installed on the main chassis 50 in order to ascend and descend the up/down gear 70. The converting lever 90 is operated by an additional driving member (not shown). An idler arm 100 is installed so as to rotate at a certain angle centering around the centrical shaft 62. An idler gear 102 is installed at the idler arm 100. A large gear 104 and a small gear 106 are formed at the idler gear 102, accordingly the idler gear 102 can receive the power by engaging with the small gear 75 and the large gear 74 of the up/down gear 70.

As depicted in Figure 4, a reference numeral 110 is a supplying reel body for operating a supplying reel of a tape, a slave gear 112 selectively engaging with the large gear 102 of the idler gear 102 is formed at the supplying reel body 110. A winding reel body is formed at the opposite side of the supplying reel body 110, it is abridged in Figure 4.

Hereinafter, the operation of the clutch device for the magnetic recording/reproducing apparatus in accordance with the present invention will be described in detail.

The clutch assembly 60 transmits a regular torque to the supplying reel body 110 and the winding reel body (not shown) for traveling of a tape T with a regular tension regardless of a quantity of the tape T wound around the supplying reel or the winding reel.

In more detail, when the rotational force of the capstan motor is transmitted through the belt 65, the power is transmitted through the driving pulley 64, the clutch spring 80, the up/down gear 70 and the idler gear 102.

The power transmission process will be described with reference to accompanying Figures 7A, 7B, 8A and 8B.

For example, as depicted in Figures 7A and 7B, when the driving pulley 64 rotates in the counter clockwise direction, when the rotational direction of the driving pulley 64 is same with the winding direction of the clutch spring 80 (shortening a diameter), the inner contacting portion 84 of the clutch spring 80 is closely contacted to the exterior of the gear holder 76, the contact of the outer contacting portion 82 of the clutch spring 80 with the inner surface of the pulley holder 66 is loosened (It is exaggerated in Figures 7A and 7B).

Then, a slip occurs between the outer contacting portion 82 and the pulley holder 66, a regular power can be transmitted.

In the meantime, as depicted in Figures 8A and 8B, when the driving pulley 64 rotates in the clockwise direction, the diameter of the clutch spring 80 is lengthened. Herein, the inner contacting portion 84 is loosened from the gear holder 76, a slip occurs between them, accordingly a specific power can be transmitted. And, the outer contacting portion 82 is closely contacted to the inner surface of the pulley holder 66.

In the meantime, as depicted in Figure 4, the converting lever 90 is rotatively installed on the main chassis 50. In more detail, the end of the converting lever 90 is hinge-connected to the main chassis 50, the other end of the converting lever 90 is placed on a protrusion portion 79 projected out from the outer circumference of the outer cylindrical portion 76a of the gear holder 76.

When the converting lever 90 is rotated at the hinge portion by an additional driving member (not shown) installed to the main chassis 50, the end of the converting lever 90 rotates downwardly. Accordingly, it pushes the protrusion portion 79, the gear holder 76 moves downwardly in Figure 4, and the engaging rib 78 of the driving pulley

64. Herein, the connection portion 86 of the clutch spring 80 generates an elastic force moving the gear holder 76 upwardly while being compressed. It is described in Figure 5.

Accordingly, the rotational force of the driving pulley 64 is directly transmitted to the gear holder 76 through the engaging ribs 68, 78 without transmitting the torque of the clutch spring 80.

As described above, in a clutch assembly for a magnetic recording/reproducing apparatus in accordance with the present invention, the interior of the upper portion and the exterior of the lower portion of a clutch spring are respectively contacted to a gear holder of an up/down gear and a pulley holder of a driving pulley, a position at which a slip occurs is varied according to a rotational direction of the driving pulley, and a regular torque can be transmitted. Accordingly, a torque adjustment according to the two-way rotation of the riving pulley can be performed with one spring.

Accordingly, a clutch device for a magnetic recording/reproducing apparatus in accordance with the present invention can reduce a production cost and simplify an assembly process by minimizing the number of components.